REMARKS

In the Office Action mailed on July 30, 2009, previous rejections of the claims were withdrawn in light of arguments made in Amendment A. New rejections of all pending claims have been made under §103(a) over Hampden-Smith (US 2006/0292434) in view of Ha et al., J. of Power Sources 112 (2002) 655-659 (the "Ha reference") with an additional reference (Lawrence et al, US Pub. No. 2002/0197522) cited in the obviousness rejection of claim 20. These rejections are traversed for the reasons set forth below.

A. THE HA REFERENCE IS NOT PRIOR ART TO AT LEAST CLAIMS 1, 19, 21-24, 27-28 AND 42 AND THE OBVIOUSNESS REJECTION OF THESE CLAIMS MUST THEREFORE BE WITHDRAWN

The obviousness rejections of all claims cites the Ha reference. The publication date of that reference is November 14, 2002. The publication was made by the inventors. To establish the publication date, applicants submit herewith a copy of the table of contents for the Journal which shows that the Journal was published on November 14, 2002. The present application claims priority on several applications, including U.S. Ser. No. 10/407,385 (now US Patent No. 7,132,188), which claims priority on provisional Application 60/369,992 filed on April 4, 2002 ("the '992 Provisional"). Because the '992 Provisional was filed earlier than the Ha reference was published, the Ha reference is not prior art to the '992 Provisional and the Ha reference cannot be cited as a prior art to presently claimed subject matter that finds support in the '992 Provisional. The subject matter of at least claims 1, 19, 21-24, 27-28 and 42 finds support in the '992 Provisional. The obviousness rejections of these claims over the Ha reference is therefore improper and must be withdrawn.

B. HAMPDEN-SMITH IS NOT PRIOR ART TO AT LEAST CLAIMS 1-6, 16, 19, 21-27, 31 AND 42, AND THE OBVIOUSNESS REJECTION OF THESE CLAIMS MUST THEREFORE BE WITHDRAWN

The obviousness rejections of all claims cites Hampden-Smith, which is believed to have a publication date no earlier than 2006. The present application claims priority on several applications, including provisional application number 60/519,092 filed November 12, 2003 ("the '092 Provisional). Because the '092 Provisional was filed earlier than the effective date of Hampden-Smith, Hampden-Smith is not prior art to presently claimed subject matter that finds support in the '092 Provisional.

The subject matter of at least claims 1-6, 16, 19 and 21-27, 31 and 42 finds support in the '092 Provisional. The obviousness rejections of these claims over Hampden-Smith is therefore improper and must be withdrawn.

C. ALL CLAIMS ARE ALLOWABLE: NO PRIMA FACIE CASE OF OBVIOUSNESS HAS BEEN ESTABLISHED SINCE THE OFFICE ACTION HAS MISCONSTRUED THE HA REFERENCE

Putting the above aside for the moment, it is further submitted that with regards to the obviousness rejection of all claims over Hampden-Smith in view of the Ha reference, it is submitted that no prima facie case of obviousness has been established. Each of these claims require (among other elements) a fuel cell (claims 1-21) or a fuel cell membrane (claims 22-36, 42) having a formic acid fuel together with an anode catalyst comprising palladium. Claims 2-5 and 25-26 recite various analyst metals present in combination with palladium, claims 6, 27, and 30-31 a carbon support, claims 7-9 and 28-29 particle dimensions, claims 11-15 and 30 various catalyst Pd dispersions, claims 19 and 42 various formic acid concentrations, claims 35-36 Pd surface area, and other claims recite other limitations.

To reject all of these claims, the Office Action cites Hampden-Smith as disclosing or suggesting all elements but for a formic acid fuel which the Office Action admits that Hampden-Smith fails to disclose or suggest. For this, page 5 of the Office Action

cites the Ha reference, and cites the abstract of Ha as disclosing that: "Ha teaches the use of methanol and formic acid as the fuel for fuel cells ... The use of a 9M formic acid and methanol can increase the current ..." (emphasis added). It is submitted that the Office Action has misconstrued the Ha reference. As best understood, the Office Action's obviousness rejection relies on the understanding that the Ha reference teaches combining formic acid fuel with methanol fuel in a fuel cell to increase power, and relies on this teaching to allege a motivation to combine the Ha reference with Hampden-Smith (which teaches a methanol fuel).

The Ha reference, however, does not disclose the combination of a formic acid fuel with methanol as the Office Action alleges. Instead, the Ha reference teaches only a formic acid fuel solution in a cell that has had its anode pre-conditioned using methanol: "This paper considers the effect of methanol pretreatment on the performance of a direct formic acid fuel cell." Abstract; "In this paper, we investigate the influence of methanol ... conditioning on the behavior of the (formic acid fuel cell)." Page 655. No disclosure of the use of methanol as a fuel can be found. Thus the Ha reference does not disclose using a formic acid fuel in combination with a methanol fuel, and the logic of the obviousness rejection of all claims is faulty. The rejections are therefore improper and must be withdrawn.

D. ALL CLAIMS ARE ALLOWABLE: NO PRIMA FACIE CASE OF OBVIOUSNESS HAS BEEN ESTABLISHED SINCE IT IS IMPROPER TO COMBINE HAMPDEN-SMITH WITH THE HA REFERENCE

The claims are allowable for the reasons set forth above. Additionally, it is further submitted that no prima facie case of obviousness has been established because it is improper to combine Hampden-Smith with the Ha reference since there has been no objective evidence put forth that one considering one of the references would be motivated to look to the other. This rejection can only be made with the impermissible use of hindsight after considering the present invention.

The MPEP states that a prima facie case of obviousness requires, among other things, objective evidence which establishes (under a preponderance of the evidence standard), a teaching to modify the prior art reference components to construct a device substantially equivalent to that claimed. This generally encompasses two sub-steps: (1) identifying objective evidence teaching how to modify the prior art components; and (2) identifying objective evidence teaching how to combine the modified individual components. MPEP §§2141, 2143.

The Examiner must set forth a rationale, supported by objective evidence (under a preponderance of the evidence standard), that the prior art at the time of invention provided a teaching to modify and/or combine the prior art reference components to achieve the claim at issue. Id. The preferable evidence is an express teaching to modify/combine within the properly defined sources of prior art. In the absence of such express teaching, an Examiner may attempt to establish a rationale to support a finding of such teaching reasoned from, or based upon, express teachings taken from the prior art. MPEP § 2144; In re Dembiczak, 50 U.S.P.Q. 2d 1614 (Fed. Cir. 1999).

This has been referred to as the "teaching/suggestion/motivation test" (TSM). Although a rigid application of TSM was rejected in KSR Int'l. Co. v. Teleflex, Inc., 82 USPQ2d 1385 (2007), the test was not discarded. The Court simply required consideration of the general knowledge of those skilled in the art and other factors, using a common sense approach to obviousness, but also warned against overly broad findings of obviousness:

> ...a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. ... (I)t can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known.

Id., at 1741 (emphasis added). The MPEP also warns against overly broad findings of obviousness based on the impermissible use of hindsight. The MPEP has set forth at

least two rules that ensure against such rejections. The first is that it is impermissible to use hindsight gained from considering the application in an obviousness rejection:

> ... the Examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was ... (made) ... Knowledge of an Applicant's disclosure must be put aside in reaching this determination, ... The tendency to resort to "hindsight" based upon an Applicant's disclosure is often difficult to avoid due to the very nature of the examination process.

MPEP §2142. Thus, if the only objective evidence of such teaching to modify and/or combine is found in applicant's disclosure, no evidence of such teaching exists.

The second rule requires that an alleged advantage or beneficial result that would have been produced by a modification and/or combination of the prior art reference components must be found in objectively verifiable teachings of the prior art. MPEP §2144. Thus, to avoid the use of impermissible hindsight, these MPEP rules make clear that absent objective evidence (sufficient to satisfy the preponderance of the evidence standard), no teaching of such modification and/or combination exists.

In consideration of the above, it is submitted that the obviousness rejections of the claims is contrary to the rules set forth by the courts and the MPEP. There has been no objective evidence put forth suggesting that one considering Hampden-Smith would be motivated to combine its teachings with those of the Ha reference. Although the Office Action alleges that Ha teaches power is increased by combining methanol with formic acid fuel and that this would motivate one considering Hampden-Smith to look to Ha, as discussed above this is not correct. Ha teaches a formic acid fuel only (with methanol preconditioning of catalyst).

No objective evidence has been put forth that one considering Ha would be led to combining its formic acid fuel with the various teachings the Office Action alleges are made by Hampden-Smith. It is further submitted that the obviousness rejection of these claims can only be made through the impermissible use of hindsight gained after considering

the present application. The rejections of all of the claims that combine Hampden-Smith with the Ha reference are therefore improper and must be withdrawn.

E. CLAIMS 6, 16, 21, 27 AND 31 ARE ALLOWABLE - THE CLAIMED FUEL CELL ACHIEVES UNPREDICTABLE AND UNEXPECTED ADVANTAGES RELATED TO PD CATALYSTS SUPPORTED ON CARBON

As discussed above, no prima facie case of obviousness has been established. Accepting only for the sake of argument that one has, however, it is submitted that this is overcome for several of the claims since they achieve unexpected and unpredictable benefits over the prior art. Caselaw and the MPEP make clear that evidence of unexpected or unpredicatable results may be sufficient to overcome an obviousness rejection. MPEP §2145.

Several claimed embodiments provide unexpected and unpredictable benefits. For example, it has been discovered that several claimed embodiments that utilize catalysts supported on carbon show higher levels of activity than would be expected in combination with low cost, lower degradation, and other advantages:

> Pd based catalysts supported on carbon have shown particularly surprising levels of activity ... Formic acid fuel cells of the invention ... have been shown to produce relatively high levels of electrical energy while requiring relatively low catalyst loadings. These surprising results offer benefits and advantages including, but not limited to, cost savings.

Page 22; "The degradation for the Pd supported on carbon catalyst, however, is less severe than that for the unsupported Pd black. ... This is a surprising and beneficial result;" Page 17; "Surprisingly, both (supported) catalysts when used at loadings of only about 1.2 mg/cm^2 result in current activity levels that are consistent with current activity (of the prior art) achieved ... using much higher loadings of about 8 mg/cm^2 of unsupported Pd. This is additional evidence that Pd based catalysts of the invention when supported on carbon offer significant benefits and advantages;" Page 18; "According to Fig. 6, carbon supported Pd catalysts of the invention show higher activity per exposed surface area than the commercial Pd black catalyst. This is a surprising and beneficial result." Page 17.

Thus the embodiments of claims 6, 16, 21, 27 and 31 provide unexpected and unpredictable results. One knowledgeable in the art involved would generally expect that supported Pd catalysts to show a lower activity per unit mass as compared to an unsupported catalyst due to a lower available surface area. Surprisingly, embodiments of the present invention show that not only is this not the case, but that in some cases just the opposite occurs – the activity increases per unit mass of Pd when it is supported. This is another reason that the obviousness rejections of claims 6, 16, 21, 27 and 31 are therefore improper and should be withdrawn.

F. CLAIMS 33-34 ARE ALLOWABLE: HAMPDEN-SMITH FAILS TO DISCLOSE OR SUGGEST THE RECITED CONDUCTIVE MESH

Claims 33-34 depend from claim 22 and further recite "an electrically conducting material overlying said anode catalyst." The specification illustrates that "overlying" includes laying over or on top of the catalyst layer (see Fig. 11 and mesh 151). The Office Action has cited para. 380-381 of Hampden-Smith as disclosing this element. Those paragraphs, however, make clear that the disclosed nickel mesh is not overlying the catalyst, but instead that the nickel mesh layer is under the catalyst layers: "... the various layers were consecutively added to a nickel mesh. ... In another example, a nickel mesh was again used and layers were deposited on the nickel mesh." Id. (emphasis added). This element has not been disclosed or suggested, with the result that the obviousness rejection of claims 33-34 is improper and must be withdrawn.

G. CONCLUSION

In conclusion, it is submitted that the claims in their present form are allowable. Timely examination and allowance are respectfully requested.

If a Petition under 37 C.F.R. §1.136(a) for an extension of time for response is required to make the attached response timely, it is hereby petitioned under 37 C.F.R. §1.136(a) for an extension of time for response in the above-identified application for the period required to make the attached response timely. The Commissioner is hereby authorized to charge fees which may be required to this application under 37 C.F.R. §§1.16-1.17, or credit any overpayment, to Deposit Account No. 07-2069.

Respectfully submitted,

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